C:\Users\ljones\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.IE5\285XVGYQ\MC900355143[1].wmfUnit 6 🡪 Types of Compounds

*Vocabulary*

|  |  |  |
| --- | --- | --- |
| anion | cation | chemical bond |
| electrolyte | formula unit | ionic bond |
| lattice energy | monatomic ion | oxidation number |
| oxyanion | polyatomic ion | coordinate covalent bond |
| covalent bond | endothermic | exothermic |
| hybridization | Lewis structure | molecule |
| oxyacid | pi bond | polar covalent |
| resonance | sigma bond | structural formula |
| VSEPR model |  |  |

*Objectives*

* **Define** chemical bond.
* **Relate** chemical bond formation to electron configuration.
* **Describe** the formation of positive and negative ions.
* **Describe** the formation of ionic bonds.
* **Account** for many of the physical properties of an ionic compound.
* **Discuss** the energy involved in the formation of an ionic bond.
* **Write** formulas for ionic compounds and oxyanions.
* **Name** ionic compounds and oxyanions.
* **Apply** the octet rule to atoms that bond covalently.
* **Describe** the formation of single, double, and triple covalent bonds.
* **Compare** and **contrast** sigma and pi bonds.
* **Relate** the strength of covalent bonds to bond length and bond dissociation energy.
* **Identify** the names of binary molecular compounds from their formulas.
* **Name** acidic solutions.
* **List** five basic steps used in drawing Lewis structures.
* **Explain** why resonance occurs, and **identify** resonance structures.
* **Explain** the octet rule, and **identify** molecules in which these exceptions occur.
* **Discuss** the VSEPR bonding theory.
* **Predict** the shape of and the bond angles in a molecule.
* **Define** hybridization.
* **Describe** how electronegativity is used to determine bond type.
* **Compare** and **contrast** polar and nonpolar covalent bonds and polar and nonpolar molecules.
* **Describe** the characteristics of compounds that are covalently bonded.

*Short Answer and Problem-Solving*

1. Name the following substances.

|  |  |  |  |
| --- | --- | --- | --- |
| H2SO4 |  | AgCl |  |
| CuNO3 |  | Ca(OH)2 |  |

1. Write the formulas for the following compounds.

|  |  |  |  |
| --- | --- | --- | --- |
| hydrofluoric acid |  | diphosphorus pentoxide |  |
| iron(III) oxide |  | aluminum chloride |  |

Unit 7 🡪 Chemical Reactions

*Vocabulary*

|  |  |  |
| --- | --- | --- |
| aqueous solution | chemical equation | chemical reaction |
| coefficient | combustion reaction | complete ionic equation |
| decomposition reaction | double replacement reaction | net ionic equation |
| precipitate | product | reactant |
| single replacement reaction | solute | solvent |
| spectator ion | synthesis reaction |  |

*Objectives*

* **Recognize** evidence of chemical change.
* **Represent** chemical reactions with equations.
* **Classify** chemical reactions.
* **Identify** the characteristics of different classes of chemical reactions.
* **Describe** aqueous solutions.
* **Write** complete ionic and net ionic equations for chemical reactions in aqueous solutions.
* **Predict** whether reactions in aqueous solutions will produce a precipitate, water, or a gas.

*Short Answer and Problem-Solving*

1. Balance and identify the type of reaction for the following using the following symbols: (s) synthesis, (c) combustion, (d) decomposition, (sr) single replacement, (dr) double replacement.

\_\_\_\_\_I2 + \_\_\_\_\_NaF 🡪 \_\_\_\_\_NaI + \_\_\_\_\_F2

\_\_\_\_\_KOH + \_\_\_\_\_AgNO3 🡪 \_\_\_\_\_KNO3 + \_\_\_\_\_AgOH

\_\_\_\_\_C3H8 + \_\_\_\_\_O2 🡪 \_\_\_\_\_CO2 + \_\_\_\_\_H2O

\_\_\_\_\_H2 + \_\_\_\_\_N2 🡪 \_\_\_\_\_NH3

\_\_\_\_\_(NH4)2SO4 🡪 \_\_\_\_\_NH3 + \_\_\_\_\_H2SO4

1. Predict the products of the following reactions.

CH4 + O2 🡪

Al + Pb(NO3)2 🡪

Ca(OH)2 + HCl 🡪

PbO2 🡪

Na + Cl2 🡪

Unit 8 🡪 Chemical Quantities

*Vocabulary*

|  |  |  |
| --- | --- | --- |
| Avogadro’s number | empirical formula | molar mass |
| mole | molecular formula | percent composition |
| actual yield | excess reactant | limiting reactant |
| mole ratio | percent yield | stoichiometry |
| theoretical yeild |  |  |

*Objectives*

* **Describe** how a mole is used in chemistry.
* **Relate** a mole to common counting units.
* **Convert** moles to number of representative particles and number of representative particles to moles.
* **Relate** the mass of an atom to the mass of a mole of atoms.
* **Calculate** the number of moles in a given mass of an element and the mass of a given number of moles of an element.
* **Calculate** the number of moles of an element when given the number of atoms of the element.
* **Recognize** the mole relationships shown by a chemical formula.
* **Calculate** the molar mass of a compound.
* **Calculate** the number of moles of a compound from a given mass of the compound, and the mass of a compound from a given number of moles of the compound.
* **Determine** the number of atoms or ions in a mass of a compound.
* **Explain** what is meant by the percent composition of a compound.
* **Determine** the empirical and molecular formulas for a compound from mass percent and actual mass data.
* **Identify** the quantitative relationships in a balanced chemical equation.
* **Determine** the mole ratios from a balanced chemical equation.
* **Explain** the sequence of steps used in solving stoichiometric problems.
* **Use** the steps to solve stoichiometric problems.
* **Identify** the limiting reactant in a chemical equation.
* **Identify** the excess reactant and calculate the amount of remaining after the reaction is complete.
* **Calculate** the mass of a product when the amounts of more than one reactant are given.
* **Calculate** the theoretical yield of a chemical reaction from data.
* **Determine** the percent yield for a chemical reaction.

*Short Answer and Problem-Solving*

1. Calculate the number of molecules in 87 grams of hydrochloric acid.
2. Calculate the number of grams of KClO3 in 1.26x1037 molecules of the compound.
3. Calculate the number of moles in 49.98 grams of Bohrium.
4. What is the percent composition of hydrogen peroxide (H2O2)?
5. Determine the empirical and molecular formula for a compound consisting of 56.4 %P and 43.6 %O with a molar mass of 220 g/mol.
6. Use the equation below to answer the following questions.

**2NaCl(aq) + H2SO4(aq) 🡪 2HCl(g) + Na2SO4(aq)**

1. Determine the limiting reactant and excess reactant when 112 grams of sodium chloride react with 203 grams of sulfuric acid. What mass of the excess reactant is left over after the reaction is complete?
2. What mass of sodium sulfate is produced?
3. Calculate the percent yield if 122 g of sodium sulfate is obtained during experimentation.

Unit 9 🡪 States of Matter

*Vocabulary*

|  |  |  |
| --- | --- | --- |
| amorphous solid | atmosphere | barometer |
| boiling point | condensation | crystalline solid |
| Dalton’s law of partial pressures | deposition | diffusion |
| dipole-dipole forces | dispersion forces | elastic collision |
| evaporation | freezing point | Graham’s law of effusion |
| hydrogen bond | kinetic-molecular theory | melting point |
| pascal | phase diagram | pressure |
| sublimation | surface tension | surfactant |
| temperature | triple point | unit cell |
| vaporization | vapor pressure | viscosity |

*Objectives*

* **Use** the kinetic-molecular theory to explain the behavior of gases.
* **Describe** how mass affects the rates of diffusion and effusion.
* **Explain** how gas pressure is measured and **calculate** the partial pressure of a gas.
* **Describe** and **compare** intramolecular and intermolecular forces.
* **Distinguish** among intermolecular forces.
* **Apply** kinetic-molecular theory to the behavior of liquids and solids.
* **Relate** properties such as viscosity, surface tension, and capillary action to intermolecular forces.
* **Compare** the structures and properties of different types of solids.
* **Explain** how the addition and removal of energy can cause a phase change.
* **Interpret** a phase diagram.

*Short Answer and Problem-Solving*

1. What is the ratio of diffusion rates for sufur dioxide and nitrogen dioxide? Which gas diffuses faster?
2. Find the partial pressure of carbon dioxide in a gas mixture with a total pressure of 30.4 kPa if the partial pressures of the other two gases in the mixture are 16.5 kPa and 3.7 kPa. Convert the partial pressure carbon dioxide to psi.

Unit 10 🡪 Gases

*Vocabulary*

|  |  |  |
| --- | --- | --- |
| Avogadro’s principle | Boyle’s law | Charles’s law |
| combined gas law | Gay-Lussac’s law | ideal gas constant |
| ideal gas law | molar volume |  |

*Objectives*

* **State** Boyle’s law, Charles’s law, and Gay-Lussac’s law.
* **Apply** the three gas laws to problems involving the pressure, temperature, and volume of a gas.
* **State** the relationship among temperature, volume, and pressure as the combined gas law.
* **Apply** the combined gas law to problems involving the pressure, temperature, and volume of a gas.
* **Relate** numbers of particles and volumes by using Avogadro’s principle.
* **Relate** the amount of gas present to its pressure, temperature, and volume by using the ideal gas law.
* **Compare** the properties of real and ideal gases.
* **Determine** volume ratios for gaseous reactants and products by using coefficients from a chemical equation.
* **Calculate** amounts of gaseous reactants and products in a chemical reaction using the gas laws.

*Short Answer and Problem-Solving*

1. Use Boyle’s, Charles’s, or Gay-Lussac’s law to calculate the missing value in each problem below.

|  |  |  |  |
| --- | --- | --- | --- |
| **P1 = ?** | **V1 = 3.1 L** | **P2 = 2.04 atm** | **V2 = 6.7 L** |

|  |  |  |  |
| --- | --- | --- | --- |
| **V1 = 873 ml** | **T1 = 365 K** | **V2 = ?** | **T2 = 345 K** |

|  |  |  |  |
| --- | --- | --- | --- |
| **P1 = 101 kPa** | **T1 = 210 K** | **P2 = 215 kPa** | **T2 = ?** |

1. A balloon will burst at a volume of 2.0 L. If the gas in a partially filled balloon occupies 0.75 L at a temperature of 21 °C, and a pressure of 990 kPa, what is the temperature at which it will burst if the pressure is 1010 kPa at the time in breaks?
2. Calculate the volume a gas will occupy under the following conditions: 3.00 mol H2 at 0.98 atm and 24 °C.
3. If 50 L of nitrogen are used with excess hydrogen to produce ammonia, what volume of ammonia is formed at STP?

**N2(g) + 3H2(g) 🡪 2NH3(g)**

Final Exam

*Example Problem*

1. Magnesium metal reacts with oxygen when supplied with sufficient activation energy. A bright white light is produced and some heat is released.
2. Write a balanced chemical equation (including states of matter). Circle your reactant(s) and underline your product(s).
3. What type of reaction is this? Check all the apply.

|  |  |  |  |
| --- | --- | --- | --- |
| **combustion** |  | **decomposition** |  |
| **double replacement** |  | **single replacement** |  |
| **synthesis** |  |  |  |

1. Is the reaction **endothermic** or **exothermic**? Circle your answer.
2. Identify the limiting reactant and excess reactant if 12.9 grams of magnesium reacts with 28.3 grams of oxygen. What amount of excess reactant is left over once the reaction is complete?
3. How many atoms of magnesium were used?
4. If the reaction occurred at STP, what is the volume of oxygen gas that was used?
5. What is the mass of the product that is formed?
6. Calculate the percent yield if 0.0115 grams is obtained during experimentation.
7. Determine the percent composition of the compound that is produced.